

REMARKS

Applicants affirm the election of group I, claims 1-13, to prosecute in the above-identified patent application. Claims 14-22 are cancelled without prejudice to continue prosecution of claims of same or similar scope in another application.

Claims 1-13 have been rejected by the Examiner. Claim 10 has been amended to correct a typographical error. Claims 1-13 are pending in this Application.

As mentioned on pages 1-3 of the Specification, the present invention relates to a diffusion barrier that can be positioned in multiple positions relative to the wafer. One known approach for improving etch rate uniformity in a chemically driven etch process is to install a diffusion barrier around the wafer perimeter. However, diffusion barriers are not used during ion-assisted (or ion-driven) etch processes (e.g. a plasma enhanced etch process). More specifically, the diffusion barrier is believed to quench the plasma and thus disturb the ion density uniformity in the plasma. If the barrier were to be used, the plasma density near the wafer perimeter would be lowered and thus cause a non-uniform etching during an ion assisted/driven etch. Because the diffusion barriers compromise the quality of an ion-driven etch, separate plasma processing chambers are often used when both ion-assisted etching and chemically driven etching is to be performed. Correspondingly, the present invention relates to a semiconductor manufacturing apparatus having a diffusion barrier that can be positioned in multiple positions relative to the wafer. In one position, the diffusion barrier acts to inhibit diffusion of neutral species which may compromise etch uniformity or quality of chemically driven etch processes. In another position, the barrier is recessed so as to not disturb an ion-assisted etch process.

Rejections Under 35 U.S.C. § 103.

Claims 1 stands rejected under 35 U.S.C. §103 as being unpatentable over U.S. Patent 6,042,687 to Singh et al. (hereinafter referred to as "Singh") in view of U.S. Patent 5,552,124 to Su (hereinafter referred to as "Su"). Applicants respectfully disagree. Applicants respectfully submit that none of the references, either alone or in combination, teach or suggest a barrier as described in independent claims 1 or 8, that the combination of references is improper, and that the references have been misinterpreted.

The teachings of Singh have been misinterpreted in the Office Action. For example, on page 4, lines 4-6, the Office Action misrepresents the teachings of Singh with: "The substrate support assembly includes a gas ring at both ends of the substrate. Such rings are referred to as focus rings which balance the gas flow above the substrate." The gas ring 167 of Singh is attached to gas inlets that supply process

gases into the processing chamber as an exemplary system for providing process gases above the substrate (see Column 1, lines 34-45). As one skilled in the art will appreciate, a gas ring is not the same as a focus ring (or diffusion barrier) and the two may not be used interchangeably.

Regardless, the brief mention of a diffusion barrier in Singh does not teach that which the Office Action clearly asserts. Singh is concerned with gas supply into the chamber and does not remotely suggest a barrier as in independent claims 1 and 8. More specifically, Singh does not teach or remotely suggest a “barrier having a first position relative to the wafer wherein the first position relative to the wafer substantially facilitates etch uniformity for a chemically driven etch process, and having a second position relative to the wafer wherein the second position relative to the wafer does not interfere with the etch uniformity of an ion driven etch process” as recited in claim 1. Singh also does not teach or remotely suggest a processing chamber suitable for chemically driven etch process and ion-assisted etch processes. For at least these reasons, Singh does teach or remotely suggest a barrier as described in independent claims 1 or 8.

The Examiner also takes the position that it would have been “obvious to modify Singh with the movable focus ring disclosed by Su since Singh also uses focus rings as diffusion barriers” (see Office Action on page 5). Applicants respectfully disagree. Applicants note that Singh teaches against the use of a focus ring or diffusion barrier. More specifically, Singh teaches “One problem with systems employing focus rings is that polymers generated from gaseous etch byproducts or reactants are sometimes deposited on the focus rings. During subsequent substrate processing, this deposited polymer can cause undesirable contamination of the substrate being processed” (see Column 2, lines 16-30). Moreover, Singh specifically teaches against approaches described in Su (see Column 2, lines 16-18). Thus, it would not be obvious to combine the references as the Office Action asserts.

In addition to the inappropriateness for combining the references, Su does not address the deficiencies of Singh. More specifically, Su does not teach a “barrier having a first position relative to the wafer wherein the first position relative to the wafer substantially facilitates etch uniformity for a chemically driven etch process, and having a second position relative to the wafer wherein the second position relative to the wafer does not interfere with the etch uniformity of an ion driven etch process”. Further, the teachings of Su have also been misinterpreted in the Office Action. The Office Action asserts that the focus ring of Su has a slotted opening and is movable (see Office Action page 4, paragraph 3). Applicants note that the slotted barrier of Su is not movable and Su indeed teaches against use of a movable barrier.



barrier of Su is not movable and Su indeed teaches against use of a movable barrier. For example, Su teaches that a movable barrier has numerous drawbacks such as build up of particulate contamination near the wafer edges (see Column 1, line 39 to Column 2, line 21).

Since both Singh and Su do not teach or remotely suggest all the limitations of the independent claims, the cited references, either alone or in combination, fail to render the claimed invention obvious. In addition, the references teach against combination with each other. Correspondingly, the combination proposed by the Office Action fails to render the claimed invention obvious.

Withdrawal of the rejection of claims 1-13 based on 35 U.S.C. § 103(a) is therefore respectfully requested.

In view of the foregoing, Applicants believe that all pending claims are allowable and respectfully requests a Notice of Allowance for this application from the Examiner. Should the Examiner believe that a telephone conference would expedite the prosecution of this application, the undersigned can be reached at the telephone number set out below.

If any fees are due in connection with the filing of this paper, the Commissioner is authorized to charge such fees to Deposit Account 50-0388 (Order No. LAM1P111).

Respectfully submitted,
BEYER WEAVER & THOMAS, LLP

William J. Plut

Limited Recognition under 37 C.F.R. §10.9(b)

P.O. Box 130
Mountain View, CA 94042-0130
Telephone: (510) 843-6200

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